PEO STRI

TRAINING & SIMULATION INDUSTRY SYMPOSIUM

PROJECT SUPPORT GROUP

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Technology Challenges

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Virtualization Strategies

- Constructive simulations, tools and interface applications are often poorly matched to their host hardware platforms. Some applications use very little of the platform's available computing power and memory while others demand more resources than a typical platform can provide. Yet each may still run on its own single platform.
- Platform virtualization is a potential strategy that can be used to pool computing resources of several applications within a federation for higher efficiency.
- Delivery of a simulation service from centrally located regional simulation hubs.

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- Human Intelligence Collection Operations modeling
  - Modeling and simulation of the complex Human Intelligence process of collection and reporting.
  - Simulation of human sources with unpredictable and sometimes unrealistic results.
  - Modeling unpredictable human intelligence sources to produce more realistic results.

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- Biometric authentication for simulation operators, role players, technicians
  - Incorporation of biometrics to replace the current user authentication method (username and password) for access to multiuser role player workstations (hardware) on large distributed system
  - Authentication must support emerging information assurance requirements

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- Automated feature extraction from imagery (Satellite/LIDAR)
  - Automated methods to extract critical features from large terrain areas
  - Feature extraction from imagery at the Geotile level
  - Includes automated merging of this extracted data with existing VMAP1 data to fill in missing VMAP information

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- Intelligent Role-Player/Operator Assistant Technologies
  - Development and integration of intelligent role player assistant technologies that can provide the role player a wider span of control and more timely situational awareness of widely dispersed (geographically) forces under his control.
  - Investigate technologies and techniques that have been proven efficient for streamlining workstation operator workload allowing a broader span of control without sacrificing ability to control a lager number of subordinate units/entities.

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- AVATAR Support for Human Intelligence Interrogation
  - Ability to produce custom characters, animations, and detailed features to help create realistic avatars for close human interaction.
  - Morphing of subjects to support lip synching and corresponding facial features.
  - Automatic lip synching, eye movement, facial gestures from computer generated speech.
  - Unique 3D Character models with flexible bone structure allowing different height characters and different genders.
  - Skeleton structure that allows for complex facial animations and/or detailed moving of the mouth. Including independent eye movement.
  - Import/export of custom animations.

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Voice Recognition Over Cluttered Radio Frequencies

- Voice recognition technology that can isolate a speaker in a cluttered RF environment.

Processing Unstructured Human Language in a Tactical Environment

- ❑ Technology that allows an unstructured description of terrain or targets to be understood by a virtual human.
- ❑ The ability to command a virtual person to take an action and/or make a decision based on information passed verbally.

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Immersive Technologies

- Autonomous CGF characters that can have meaningful interactions with a trainee
- Seamless ability to grab control CGF
- Improved HMD
  - 110 deg horizontal field of view, low cost, 1280 x 1024, rugged
- Improved locomotion devices
- Low cost, wireless hand and arm sensors
- Low cost haptic vest/suit

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- Accurate and Affordable High Fidelity Weapon Orientation Sensor
  - High fidelity weapon orientation
    - High fidelity pointing vectors for weapons within their operational environments (i.e., ferrous metals)
    - Accuracy: < .1 degrees
    - Small form/fit, SWaP-C, Non-obtrusive to player/weapon
    - Simple calibration method
- Accurate and Affordable Geo-location/Situational Awareness capabilities for indoor and GPS-denied environments
  - A high fidelity position/location system for real-time tracking soldiers in an indoor/urban or GPS-denied environment
    - “Best” technologies?
      - UWB, RF, GPS, Acoustic, IR, Video, magnetic, etc.
    - Accuracy: 6-8 inches/15-17 cm (T); 3-4 inches/10 cm (O)
    - Low impacts to both soldier and infrastructure

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- Highly scalable and mobile multimedia wireless networks
  - Capable of providing seamless exercise movement across vast training/testing areas
  - Capable of transmitting high throughput LOS and NLOS application data from player units with QoS to exercise controller
  - Able to provide MANET, multi-hop and point to multipoint connectivity with low latency
  - Integrating spectral efficient software defined radio technology capable of transmitting multiple waveforms
  - Migrating to converge legacy voice, video and data networks into a single IP based multimedia network
  - Interoperable across live testing and training communities
  - Utilizing the best technologies, protocols and open standards
    - Ex: IEEE, 3GPP, Best PAN standards; DARPA WNaN

PEO STRI Technology Challenges

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- Software Defined Radios (SDR)/Cognitive Radios/Dynamic Spectrum Assess (DSA) technologies
  - Affordable approach to support test/training applications
  - Configurable multi-spectrum SDR/Cognitive radios
  - Frequency agility via dynamic baseband filtering
  - Small form/fit footprint which makes extensive use of COTS or Military radios.
  - Supports multiple waveforms

- Waveform
  - Spectral efficient waveform and applications (MIMO, DSA)
  - Power efficient player units
  - Waveforms: JTRS SRW, JTRS WNW, OT TES OFDM/HYNET, Secured commercial 4G: LTE and 802.16e/j
  - Waveform components being able to coexist in LT2 as software components
  - MAN/WAN/WLAN/PAN applications

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Adaptive Behavior Targets

- Provide an autonomous behavior target
  - Asymmetric and reactive threat
  - SAF emotion engine using sensor inputs
- Inter-target communication
  - All targets share event data
  - Reactions to events on other targets
- Provide enhanced realism
  - Realistic thermal/IR signature
  - Improved mobility (track-less)
  - Bi-directional voice capabilities
- Support live fire with minimal failures/high RAM

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Non-Contact Hit Sensor

- Create a sensor field/zone for an area/target of interest
  - Non-gated operation
  - 2 or 3 dimensional areas of interest
- Provide accurate identification of penetration point
- Identification of objects entering field/zone
  - By caliber
  - Munitions vs debris
- Must support both super and sub sonic munitions
- Support live fire with minimal failures/high RAM

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Fuel Cells/Batteries – Lighter, smaller, low cost

Wireless Communications

- Real time ray tracing communications model of 30k+ entities OFDM for 4G wireless internet
- More mature narrow band OFDM on small form factors
- Transmission of classified data from remote instrumentation

Physics/effects modeling of Digital Radio Freq Memory (DRFM) waveforms in M&S and injection for electronic attack simulators.

Low cost sophisticated remote target control – Technology has yet to drive down costs of complex target control systems. (UAVs)

Target remote control in GPS denied environment.

Cognitive Evaluation - Advanced sensors and algorithms for EEG, ECG, EMG, EG, CBT. Etc.

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INDUSTRY SYMPOSIUM